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Another component is similar to the X-rays, and is probably a phenomenon of the ether rather than of ordinary matter. Perhaps this component is produced by the action of the first component, as the X-rays are produced by the action of the cathode rays. For the rest no satisfactory explanation has been given. Many of the secondary effects seem to result from a fine dust emitted from the radio-active substance. Possibly there is only a single primary radiation, the rest being secondary effects, as the cathode rays generate the X-rays and these in turn generate their complex secondary radiations.

The chemical nature of the radio-active substances or elements is still little understood, nor is it surprising when one considers the difficulty of working with substances occurring in such minute quantities as these. Only one new element, radium, is definitely established. Hofmann and Strauss thought they had isolated another new radio-active element, but while still claiming the new element, they now admit that it is not radio-active.

The question of the source of energy in these radiations is yet unanswered. Is the energy potential in an unstable molecular or atomic structure, or is it supplied continuously by outside sources? In the first case, how long will the energy last? In either case, is it a property that matter in general may under proper conditions assume, or is it, as it seems, restricted to a very few peculiar elements? Heat or cold, high or low pressure, has little influence on the emission of the rays. Mme. Curie once put forth the hypothesis that perhaps the radiation is induced in the radio-active elements by a sort of transcendental radiation more penetrating than the X-rays and pervading all our space. Professor Geitel found that if so the exciting radiations penetrate easily hundreds of yards of rock, for radium was still active at the bottom of

the deepest mine to which he had access. Finally, the study of the radio-active substances will surely lead to a better knowledge of that which is the subject of much of the physical research of to-day, the intimate structure of matter.

GEO. B. PEGRAM.

COLUMBIA UNIVERSITY,

June 21, 1901.

*THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.*

THE following have completed their membership in the American Association for the Advancement of Science during the month of June.

Dr. Francis E. Abbot, Author, 43 Larch Road, Cambridge, Mass.

Ernest Kempton Adams, Scientific Investigator, 455 Madison Ave., New York, N. Y.

Harry Alexander, Elec. and Mech. Engineer, 18 and 20 West 34th Street, New York, N. Y.

E. B. Alsop, Metallurgy and Engineering, 541 Wood Street, Pittsburg, Pa.

James I. Ayer, Electrician, 5 Main Street Park, Malden, Mass.

Ralph Baggaley, engineer, Pittsburg, Pa.

Daniel Moreau Barringer, Geologist and Mining Engineer, 460 Bullitt Building, Philadelphia, Pa.

Professor Walter B. Barrows, Prof. of Zoology, Agricultural College, Michigan.

Francis Bartlett, 40 State Street, Boston, Mass.

James Newton Baskett, Author-Zoologist, Mexico, Mo.

Rev. John Mallory Bates, Botany, Callaway, Neb.

Dr. Henry Harris Aubrey Beach, Physician, 28 Commonwealth Avenue, Boston, Mass.

Professor Arthur E. Beardsley, Prof. of Biology, State Normal School, Greeley, Colo.

Bernhard Arthur Behrend, Civil and Elec. Engineer, Station H, Cincinnati, Ohio.

August Belmont, 23 Nassau Street, New York City.

Charles W. Bennett, Geologist, Coldwater, Mich.

Dr. Augustus C. Bernays, Specialist in Embryology, Anatomy and Surgery, 3623 Laclede Avenue, St. Louis, Mo.

Solomon H. Bethea, United States Attorney, Chicago Club, Chicago, Ill.

Dr. Leslie D. Bissell, Physics, Hotchkiss School, Lakeville, Conn.

Dr. John B. Blake, Physician, 302 Beacon Street, Boston, Mass.

Lemuel Stearns Boggs, care Sargent & Lundy, 1,000 Isabella Building, Chicago, Ill.

Henry Martin Boies, President Moosic Powder Co., 530 Clay Avenue, Scranton, Pa.

Dr. Arnold L. Bossi, Chemist and Colorist, Manchester Mills, 1962 Elm St., Manchester, N. H.

Louis F. G. Bouscaren, Chief Engineer, Water Works Commis., City Hall, Cincinnati, Ohio.

Albert A. Brooks, Teacher of Botany and Zoology, High School, Kansas City, Kans.

Frederick Burbidge, Mgr. Bunker Hill and Sullivan Mining and Concentrating Co., Kellogg, Idaho.

M. D. Burke, Civil Engineer, 404 Pike Building, Cincinnati, Ohio.

Robert E. Burke, Chemist, Mechanic Arts High School, 156 M Street, S. Boston, Mass.

Samuel Cabot, Chemist, 70 Kilby Street, Boston, Mass.

Professor Florian Cajori, Prof. of Mathematics, Colorado, Col., 1119 Wood Avenue, Colorado Springs, Col.

Frederic J. Carnell, Physics, 58 North Sheffield Hall, New Haven, Conn.

Arthur E. Childs, Mechanical and Electrical Engineer, 23 Central Street, Boston, Mass.

Isaac M. Cline, M.D., Section Director, U. S. Weather Bur., Weather Bur., Galveston, Texas.

Mendes Cohen, Civil Engineer, 825 N. Charles Street, Baltimore, Md.

Vernon G. Converse, Mechanical Engineer, 15th Street and Liberty Avenue, Pittsburg, Pa.

Robert E. Cranston, Mining Engineer, Folsom, Cal.

David F. Crawford, Supt. Motive Power, Penn. R. R. Co., Fort Wayne, Ind.

Albert C. Crehore, Vice-President Crehore-Squier Intelligence Transmission Co., Brookside Park, Tarrytown, N. Y.

Frank H. Cockard, Civil and Mining Engineer, L. B. 34, Wheeling, W. Va.

Geo. W. Curtiss, Weatherford, Texas.

Irving S. Cutter, Botanist and Zoologist, Box 732 Lincoln, Nebr.

Dr. W. H. Dalrymple, Prof. Veterinary Science, La. State University, Baton Rouge, La.

Charles F. Davis, Chemist, Fort Collins, Colo.

William H. Davis, Assistant in Psychology, Columbia University, New York, N. Y.

William W. Davis, Chemist, Virginia Iron, Coal and Coke Co., Bristol, Tenn.

William H. Dean, Chemist, 167 West River Street, Wilkesbarre, Pa.

Frederic A. Delano, Supt. Motive Power, C. B. and Q. R. R. Co., 209 Adams Street, Chicago, Ill.

Alva C. Dinkey, General Supt. Steel Works, Homestead Steel Works, Munhall, Pa.

Rev. Charles F. Dole, Jamaica Plain, Mass.

Alexander Dow, Mech. and Elec. Engineer, 844 Cass Avenue., Detroit, Mich.

Dr. H. R. Dudgeon, Physician and Surgeon, Sealy Hospital, Galveston, Texas.

S. W. Dudley, Mech. Engineer, 15 Austin Street, Westville, Conn.

Robert B. Dunlevy, Geologist and Chemist, Winfield, Kans.

Dr. Robert T. Edes, Physician, 15 Greenough Avenue, Jamaica Plain, Mass.

August Eimer, 220 East 19th Street, New York City.

Robert W. Ellis, Tabor, Iowa.

Morton J. Elrod, Prof. of Biology, Univ. of Montana, Missoula, Mont.

Arthur B. Emmons, Newport, R. I.

Frederic J. Falding, Consulting Chemical Engineer, 52 Broadway, New York City.

Professor Richard E. Fast, Prof. Amer. Hist. and Political Sci., State University, Morgantown, W. Va.

William B. Fisher, Mining Engineer, Carterville, Mo.

M. Judson Francisco, 49 Merchants' Row, Rutland, Vt.

George C. Gardner, Mills Bldg., 35 Wall Street, New York City.

Albert O. Garrett, Teacher of Science in High School, Fort Scott, Kans.

Frank A. Giffin, Mathematician and Physicist, Boulder, Colo.

Dr. Joseph L. Goodale, Physician, 397 Beacon Street, Boston, Mass.

Elmer F. Goodwin, Prof. of Physics and Chemistry, Athens, W. Va.

John F. Goucher, President of The Woman's College, Baltimore, Md.

Julian H. Granbery, Ass't Engineer, Manhattan R. R. Co., 670 Pennsylvania Avenue, Elizabeth, N. J.

Arthur O. Granger, Astronomy, Physics, Cartersville, Ga.

J. Evarts Greene, 98 Lincoln Street, Worcester, Mass.

Charles M. Hall, care Pittsburg Reduction Co., Niagara Falls, N. Y.

Dr. Frank K. Hallock, Physician and Surgeon, Cromwell, Conn.

Mrs. Carolyn W. Harris, Chilson Lake, N. Y.

Frederick S. Harris, Mining, Monticello, Kans.

J. Dawson Hawkins, Chemist, Colorado Springs, Colo.

Charles I. Hays, Northside High School, Denver, Colo.

Tracy E. Hazen, Director of Museum and Botanist, The Fairbanks Museum, St. Johnsbury, Vt.

Harry E. Heath, Chief Engineer Eddy Elec. Mfg. Co., Windsor, Conn.

Junius Henderson, 1933 13th Street, Boulder, Colo.

Conrad E. Hesse, Meteorology, U. S. Weather Bureau, 807 Mass. Avenue N. E., Washington, D. C.

John A. Higginson, 260 Clarendon Street, Boston, Mass.

John L. Hildreth, 14 Garden Street, Cambridge, Mass.

Franklin W. Hooper, Curator of Brooklyn Institute, Brooklyn, N. Y.

Wilson S. Howell, Secy. Asso. Edison Illuminating Companies, 14 Jay Street, New York, N. Y.

Geo. W. Hunsicker, Chemist, 141 North 8th Street, Allentown, Pa.

D. B. Huntley, Mining Engineer, De Lamar, Idaho.

Professor Thomas M. Iden, Prof. of Chemistry and Physics, State Normal School, Emporia, Kansas.

Dr. Geo. F. Jelly, Physician, 69 Newbury Street Boston, Mass.

Dr. Walter P. Jenney, Consulting Geologist and Mining Engineer, Kuntsford Hotel, Salt Lake City, Utah.

Thomas J. Johnston, Lawyer, 66 Broadway, New York City.

Professor Clement R. Jones, Prof. Mech. Engineering, W. Va. University, Morgantown, W. Va.

Francis Juat, M.D., Physician, Aberdeen, N. C.

Julius Kahn, Chemist, 100 West 80th Street, New York City.

Pierre O. Keilholtz, Consulting Engineer, Continental Trust Building, Baltimore, Md.

Walter S. Kelley, Mining Engineer, The New Elk-horn Mining Co., Ltd., Leadville, Colo.

Dr. Arthur E. Kennelly, Electrical Engineer, Crozer Building, Philadelphia, Pa.

James M. Kent, Instructor Steam and Elec., Manual Training High School, 2726 Holmes Street, Kansas City, Mo.

Oscar C. Kenyon, Teacher of Physics, High School, Syracuse, N. Y.

Walter M. Kern, Supt. City Schools, David City, Neb.

Edwin B. Kimball, Mining Engineer, Oroville, Cal.

Arthur Kirk, Engineering and Economics, 910 Duquesne Way, Pittsburgh, Pa.

Frank Klepetko, Manager Reduction Works, Anaconda Copper Mining Co., Butte, Montana.

Francis H. Knox, Electrical Engineer, Spartanburg, S. C.

Henry H. Knox, Mining Engineer, 110 East 23d Street, New York City.

Professor Charles H. Kretz, Asst. Prof. Mech. Engineering, State University, Baton Rouge, La.

Dr. Thos. S. Latimer, Physician, 211 West Monument Street, Baltimore, Md.

Paul M. Lincoln, Electrical Engineer, care Niagara Falls Power Co., Niagara Falls, N. Y.

Anthony F. Lucas, Mining Engineer, Beaumont, Texas.

Jacob L. Ludlow, 434 Summit Street, Winston, N. C.

Chester W. Lyman, International Paper Co., 30 Broad Street, New York City.

James H. McClelland, M.D., Anatomy and Physiology, 5th and Wilkins Avenues, Pittsburg, Pa.

James R. Macfarlane, President Acad. Science and Art of Pittsburg, 434 Diamond Street, Pittsburg, Pa.

Louis J. Magee, Electrical Engineer, Grosse Quer Alle 1, Berlin, Germany.

Louis B. Marks, 687 Broadway, New York City.

Dr. Frank W. Marlow, Physician, 200 Highland Street, Syracuse, N. Y.

Harry N. Marvin, Inventor of Marvin Electric Drill, 841 Broadway, New York, N. Y.

Rodolph Matthews, 128 North Main Street, Wichita, Kansas.

George C. Maynard, 1407 15th St., N. W. Washington, D. C.

Oliver P. Medsger, Botany, Jacobs Creek, Westmoreland Co., Penna.

Dr. Charles F. Menninger, Physician and Surgeon, 1251 Topeka Avenue, Topeka, Kansas.

Harriet L. Merrow, R. I. Col. Agr. and Mech. Arts, Kingston, R. I.

Francis T. Miles, M.D., Practicing Physician, 514 Cathedral Street, Baltimore, Md.

Henry H. Miller, Mining and Metallurgical Engineer and Chemist, care American Copper Mining Co., Somerville, N. J.

Herbert S. Miller, Electrical Engineer, 1025 East Jersey Street, Elizabeth, N. J.

Professor Wm. S. Miller, University of Wisconsin, Madison, Wis.

Louis Mohr, Mechanical Engineer, 32 Illinois Street, Chicago, Ill.

Professor Joseph E. Monroe, Prof. Physics and Chemistry, State Normal School, Dillon, Montana.

Charles J. Moore, Mining Engineer, P. O. Box 548, Cripple Creek, Colo.

Philip North Moore, Geologist and Mining Engineer, 121 Laclede Building, St. Louis, Mo.

Geo. S. Morison, Civil Engineer, 49 Wall Street, New York City.

Willard S. Morse, care M. Guggenheim's Sons, 30 Broad Street, New York City.

Dr. John C. Munro, Instructor in Surgery, Harvard Medical School, 173 Beacon Street, Boston, Mass.

Samuel G. Neiler, Consulting and Designing Engineer, 1409 Manhattan Building, Chicago, Ill.

Professor Henry B. Newson, Associate Prof. of Mathematics, University of Kansas, Lawrence, Kan.

Martin H. Offinger, Director Electric Mech. Dept. of Buffalo Com. and Electro-Mech. Institute, 221 E. Hampshire St., Buffalo, N. Y.

Herbert G. Ogden, Jr., Patent Attorney, 1610 Riggs Place, Washington, D. C.

William Oothout, Chemist, Metallurgist and Mining Engineer, Santa Barbara, Cal.

Loyall A. Osborne, Electrical Engineer, 617 S. Linden Avenue, Pittsburg, Pa.

Geo. A. Packard, Metallurgist and Mining Engineer, 18 Lafayette Street, Wakefield, Mass.

William L. Parker, 339 Marlborough Street, Boston, Mass.

Frank Patrick, 601 Kansas Avenue, Topeka, Kan.

Frank A. Pattison, Consulting Electrical Engineer, 141 Broadway, New York, N. Y.

W. A. Peck, Civil and Mining Engineer, 1643 Champa Street, Denver, Colo.

Bertel Peterson, Mining Engineer, Gen. Man. Grand Central Mining Co., Ltd., Torres, Sonora, Mexico.

Andrew Pinkerton, Electrical Engineer, Vandegrift, Westmoreland County, Pa.

H. Hobart Porter, Jr., Consulting Elec. and Mech. Engineer, 31 Nassau Street, New York, N. Y.

J. Edward Porter, Chemist, Syracuse, N. Y.

Dr. Thomas Powell, 215-217 Laughlin Building, Los Angeles, Cal.

Charles W. Pratt, Supt. City Schools, Augusta, Butler County, Kan.

Thomas M. Price, Asst. Chemist, Agr. Exp. Sta., College Park, Maryland.

Edw. A. Quintard, Assayer, Metallurgist and Supt. Mines at Batopilas, Mex., Sewanee, Tenn.

Beverley S. Randolph, Mining Supt. Consolidation Coal Co. of Maryland, Frostburg, Md.

Albert G. Rau, Prin. Moravian Parochial School, 63 Broad Street, Bethlehem, Pa.

Lt.-Col. Samuel Reber, U. S. A., Headquarters of the Army, Washington, D. C.

Joseph A. Rice, 138 South New Street, Bethlehem, Pa.

Louis D. Ricketts, Consulting and Mining Engineer, 99 John Street, New York, N. Y.

Otto Rissmann, care Cherokee-Lanyon Spelter Co., Iola, Kan.

Professor Elbert W. Rockwood, Prof. Chemistry and Toxicol., State University, Iowa City, Iowa.

Henry G. Reist, Mechanical and Electrical Engineer, 5 South Church Street, Schenectady, N. Y.

Dr. William H. Rollins, Physician, 250 Marlborough Street, Boston, Mass.

Professor Herbert E. Russell, Prof. Math., Univ. Denver, University Park, Colo.

Frederick A. Scheffler, Electrical Engineer, Box 233, Glen Ridge, N. J.

Edward H. Sears, Manufacturer, Collinsville, Conn.

Henry F. Sears, 8 Beacon Street, Boston, Mass.

Benjamin L. Seawell, Teacher of Biology, State Normal School, Warrensburg, Mo.

Gen. Edward W. Serrell, Civil Engineer, Forest Avenue, West New Brighton, Richmond Co., N. Y.

Charles C. Sharp, Mining Engineer, Boomer, W. Va.

Benjamin F. Sharpe, Teacher of Physics, Greenwich, N. Y.

Dr. Frederick C. Shattuck, Prof. Clinical Medicine, Harvard University, 135 Marlborough Street, Boston, Mass.

Edwin C. Shaw, Mechanical and Electrical Engineer, 104 Park Street, Akron, Ohio.

Dr. Matthew M. Smith, Physician, Austin, Texas.

Dr. Arthur E. Spohn, Physician and Surgeon, Corpus Christi, Texas.

Morrill D. Stackpole, Gen'l Supt., O. G. M. Co., care Overland Gold Mining Co., Sunshine, Utah.

Philip K. Stern, Consulting Mechanical and Electrical Engineer, 130 Fulton Street, New York City.

Charles H. Sternberg, Paleontology and Geology, Lawrence, Kan.

James F. Stevens, M.D., 1136 O Street, Lincoln, Neb.

Dr. Robert W. Stewart, Physician, Park Building, Pittsburg, Pa.

Luther Stieringer, 129 Greenwich Street, New York City.

Lewis B. Stillwell, Engineering, Park Row Building, New York City.

Professor William D. Tallman, Prof. Math. Mont. State Col., L. B. 170, Bozeman, Mont.

Hermann Thiemann, Manchester, Mass.

Rev. Marcus Alden Tolman, Clergyman, 123 S. High Street, Bethlehem, Pa.

Theodore Tonnele, Metallurgical Engineer, 919 College Avenue, Pittsburg, Pa.

Rodney H. True, Botanical Museum, Harvard University, Cambridge, Mass.

Louis B. Tuckerman, Jr., Physics, 298 Central Avenue, Cleveland, Ohio.

Archelaus E. Turner, President of Waynesburg College, Waynesburg, Pa.

Professor Albert H. Tuttle, University of Virginia, Charlottesville, Va.

William B. Vansize, Solicitor of Patents, 253 Broadway, New York City.

Benjamin M. Watson, Bussey Institution, Jamaica Plain, Mass.

Ulysses G. Weatherly, Prof. of Economics, University of Indiana, Bloomington, Ind.

Edwin R. Weeks, Electrical Engineer, 3408 Harrison Street, Kansas City, Mo.

Henry L. Wheeler, Chemistry, Sheffield Laboratory, New Haven, Conn.

Schuyler S. Wheeler, Ampere, N.J.

William H. Wiley, Civil and Electrical Engineer, 43 East 19th Street, New York City.

Julius T. Willard, Director of Exper. Sta. and Teacher of Chemistry, 1211 Moro Street, Manhattan, Kan.

Dr. Robert Lee Wilson, Surgeon, U. S. Marine Hospital Service, Box 274, Honolulu, H. I.

Tyler R. Woodbridge, Civil Engineer, care Taylor & Brunton Sampling Co., Victor, Colo.

George McK. Woodworth, Asst. Exam. Elec. Div. Patent Office, 1424 S. Street, N. W., Washington, D. C.

Alexander J. Wurts, Westinghouse Elec. & Mfg. Co., Allegheny, Pa.

#### SCIENTIFIC BOOKS.

*Les problèmes de la vie.* 1<sup>re</sup> Partie. La Substance vivante et la cytodièrèse. Par DR. ERMANNO GIGLIO-TOS. Turin. 1900.

A title, such as the author of the present volume has selected, is apt to excite suspicion by suggesting a discussion of phenomena for the explanation of which the data at our disposal seem at present hardly sufficient. The time when the biologist was content with an *ignoramus* or with the endeavor to conceal his ignorance under cover of vital force has passed away, and a school has arisen which pins its faith on the investigation of *Entwicklungsmechanik*, but which, it must be confessed, still subsists on the substance of things hoped for. The pendulum has swung from the predication of a special force to the application of the fundamental principles of physics and mechanics, but without as yet yielding the desired explanation of protoplasmic activity, possibly because the new position has not yet been sufficiently exploited.

Professor Giglio-Tos, however, believes that the lack of conclusive results is due to the pendulum having swung too far; the basis of an explanation of the phenomena of life is to be sought, in his opinion, not so much in the physical as in the chemical principles involved. The most fundamental of all the vital functions is assimilation and this he believes is exclusively a chemical phenomenon, perfectly analogous to the changes which organic chemical compounds may be made to undergo in our laboratories, acetic acid, for instance, if supplied with the proper food in the way of reagents, assimilating these and producing with their aid additional molecules of acetic acid. The example which he gives in illustration of the chemical nature of assimilation is so suggestive that it may be repeated here.

